NIO 2MP LED Display

User Guide

MDNC-2221

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Visibly yours

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TABLE OF CONTENTS

1. Welcome! 3
1.1 About the product 3
1.2 What's in the box 3

2. Parts, controls and connectors 5
2.1 Display front view 5
2.2 Display rear view 6

3. Display installation 9
3.1 Unlocking the height mechanism 9
3.2 Adjusting the display position 9
3.3 Removing the connector compartment cover 10
3.4 Connecting the signal cables 10
3.5 Routing the cables & Reattach the connector compartment cover 12
3.6 VESA-mount installation 12
3.7 First time starting up 14

4. Daily operation 15
4.1 Recommendations for daily operation 15
4.2 Key indicator lights 16
4.3 Standby switching 16
4.4 Bringing up the OSD menus 17
4.5 Navigating through the OSD menus 17

5. Advanced operation 19
5.1 OSD menu language 19
5.2 OSD menu automatic close function 19
5.3 Power status indicator light 19
5.4 Key indicator lights 20
5.5 Power lock function 20
5.6 DPMS mode 20
5.7 Hibernate 21
5.8 Luminance target 21
5.9 Viewing modes 22
5.10 Display functions 22
5.11 Reading rooms 23
5.12 Display orientation 24
5.13 Video input signals 24
5.14 EDID timings 24
5.15 Display info 25
5.16 Display status 25

6. Maintenance 27
6.1 Cleaning instructions 27

7. Important information 29
7.1 Safety information 29
7.2 Environmental information 31
7.3 Regulatory compliance information 33
7.4 EMC notice 33
7.5 Explanation of symbols 37
7.6 Legal disclaimer 39
7.7 Technical specifications 40
7.8 Compatible display controllers 41
7.9 Open source license information 42

1. WELCOME!

1.1 About the product

Overview

Thank you for choosing this NIO 2MP LED Display!

NIO 2MP LED Display is an industry-standard 2MP color display system with LED backlights for dependable diagnostic viewing in high-bright color. NIO 2MP LED Display provides an effective display solution for a multitude of applications and modalities.

Confident color reading

Equipped with high-bright LED backlights, NIO 2MP LED Display delivers excellent brightness and more shades of gray to detect subtle details more quickly. The unique front sensor ensures you see consistent and precise images at all times for confident diagnoses.

On-demand image quality checks

As the front sensor works seamlessly together with Barco's online MediCal QAWeb service for automated Quality Assurance and calibration, NIO 2MP LED Display makes sure you are viewing perfect DICOM images — at the click of a button — without interrupting your workflow.

A good investment

Using power-efficient LED backlights, NIO 2MP LED Display is as low in power consumption as it is high in brightness. Because it uses less power, the display produces less heat and requires less cooling, which impacts maintenance and operational costs. Additionally, the LED backlights offer a long lifetime — even at high brightness — providing a high return on your investment.

CAUTION: Read all the important safety information before installing and operating your NIO 2MP LED Display. Please refer to the dedicated chapter in this user guide.

1.2 What's in the box

Overview

Your NIO 2MP LED Display comes with:

- the display
- a system tilt and swivel foot
- this NIO 2MP LED Display user guide
- a system CD
- a DisplayPort cable
- a DVI cable
- an USB cable
- an AC power cord
- an external power supply

If you ordered a Barco display controller, it's also in the box together with its accessories. A dedicated user guide is available on the system CD.

Keep your original packaging. It is designed for this display and is the ideal protection during transport and storage.

2. PARTS, CONTROLS AND CONNECTORS

2.1 Display front view

Overview

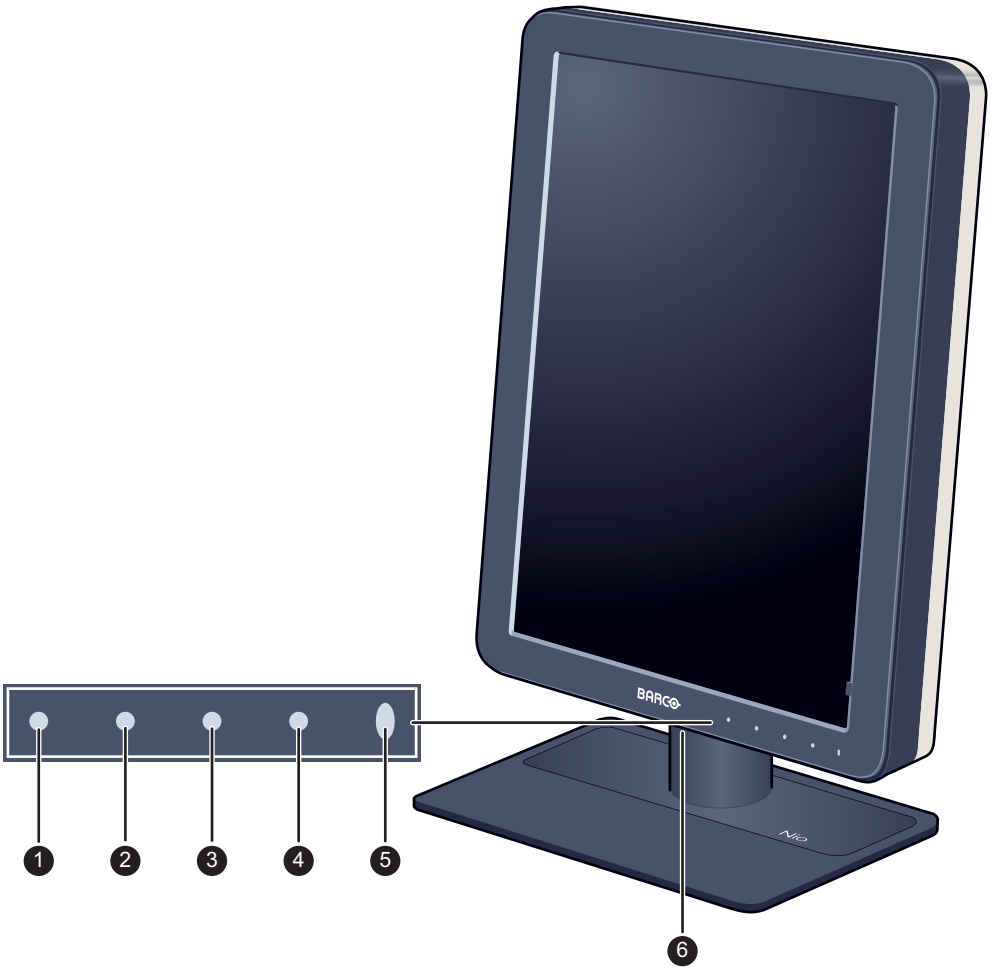


Image 2-1
Front view

1. Left key
2. Right key
3. Menu key
4. Standby key
5. Power LEDs
6. Bottom downstream USB

The key icons are displayed above the keys, adapted to the function that it is used for (menu dependent). See "Navigating through the OSD menus", page 17.

2.2 Display rear view

Connector compartment cover closed

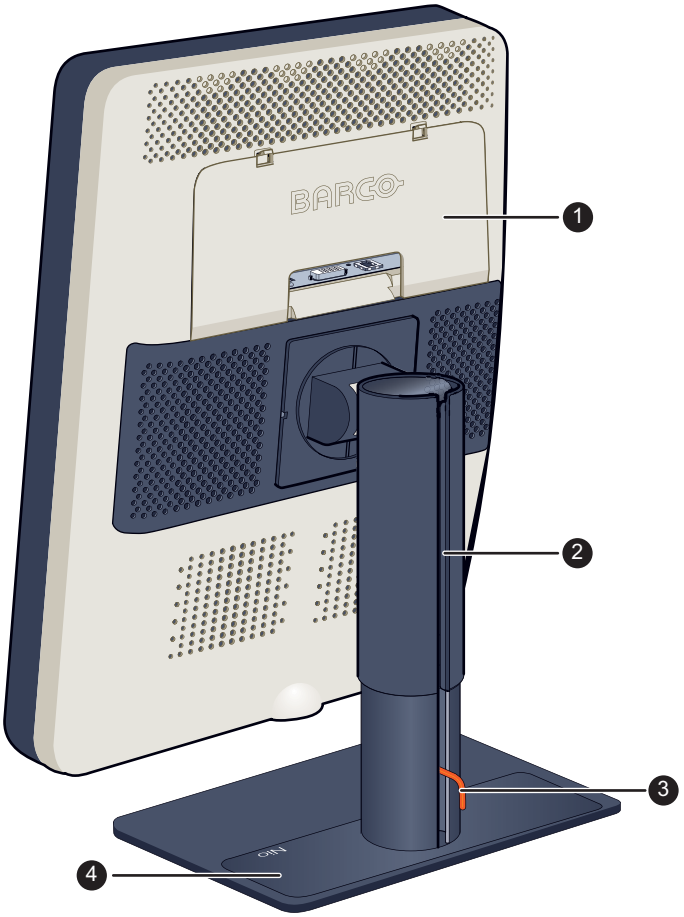


Image 2-2
Rear view with closed connector compartment cover

1. Connector compartment cover
2. Cable duct
3. Foot lock clip
4. Tilt & swivel foot

Connector compartment cover open

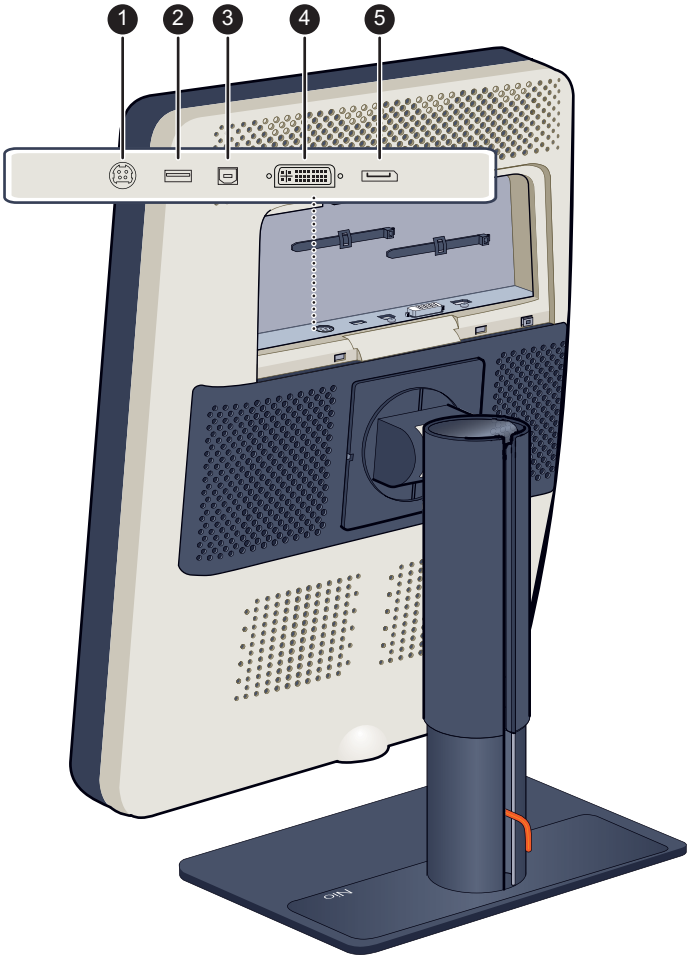


Image 2-3

1. +24 VDC power input
2. USB downstream connector
3. USB upstream connector
4. DVI video input
5. DisplayPort video input

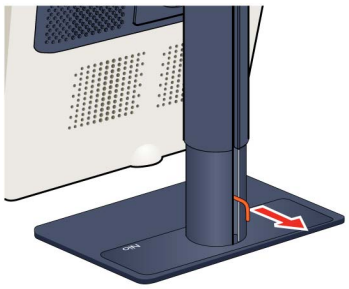
3. DISPLAY INSTALLATION

Prior to installing your NIO 2MP LED Display and connecting all necessary cables, make sure to have a suitable display controller physically installed in your computer. If you are using a Barco display controller, please consult the user guide delivered with it to do this.

3.1 Unlocking the height mechanism

To remove the clip:

1. Position the display with its rear side facing you.
2. Pull the red clip out of the fixation hole in the foot.

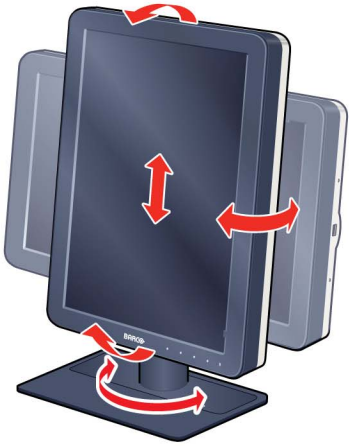


3. Keep the clip in the dedicated hole in case the display needs to be shipped later.

3.2 Adjusting the display position

To adjust the display position

1. Stand at the front side of the panel and take the panel at both sides.
2. Very important: Tilt the panel upwards before changing the orientation.



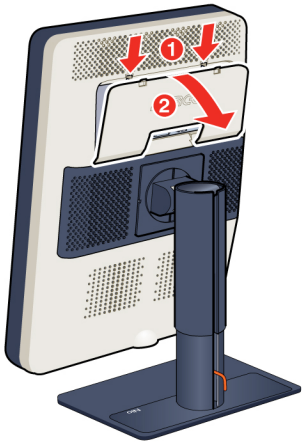
3. To change from portrait to landscape, turn the panel counterclockwise.
4. To change from landscape to portrait, turn clockwise.

If, after installing the display of the system, you change the panel orientation while an image is on the screen, the result depends on the graphic board and the resolution of the image. In some cases the image will be rotated automatically, in other cases it will not be rotated (e.g., when pixels would be lost after rotation). If necessary, change the image resolution in the display control panel and restart the system after changing the orientation.

3.3 Removing the connector compartment cover

To remove the connector compartment cover

1. Gently push the two lips on top of the cover
2. Pull the top of the cover slightly away from the display and lift the cover upwards.



3.4 Connecting the signal cables

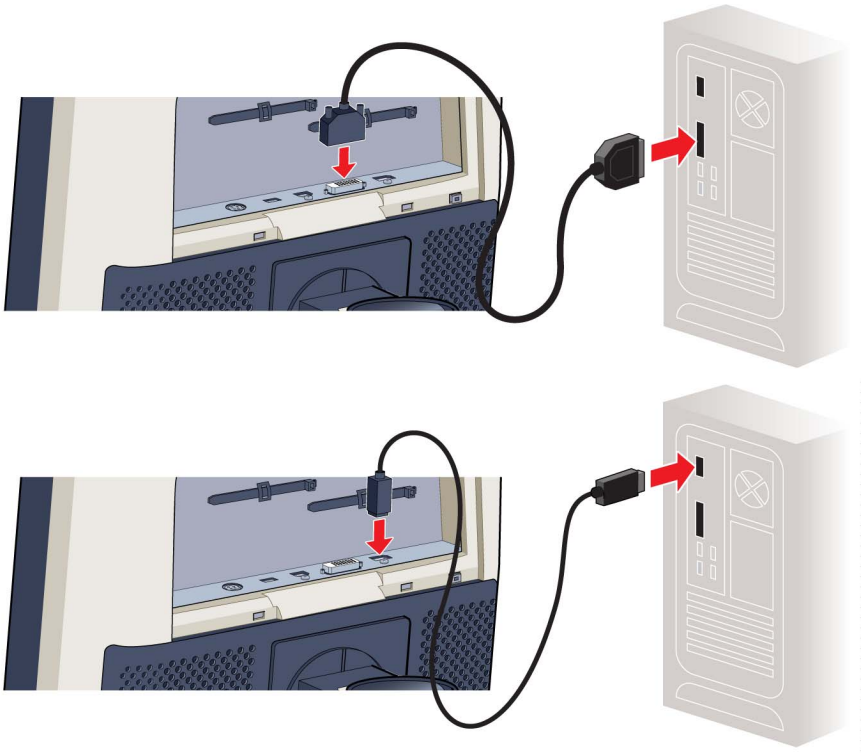
CAUTION: Only connect one of the two video links. Connecting both inputs simultaneously will result in driver errors.

To connect the signal cables to the display:

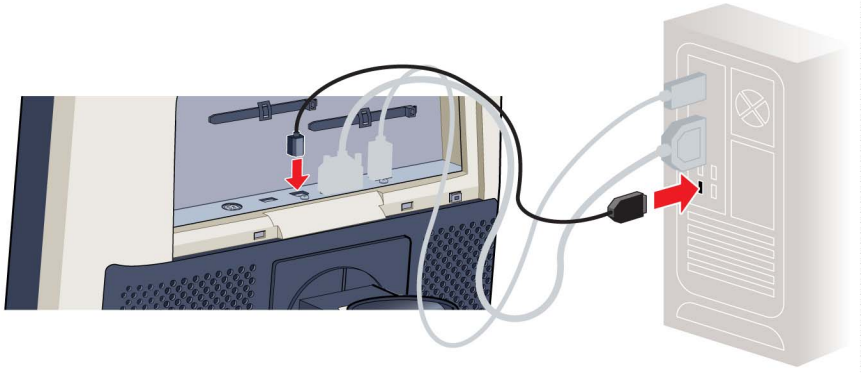
To get access to the connectors, remove the connector compartment cover. See "Removing the connector compartment cover", page 10.

You may connect the display to a display controller by using the DVI or the DP connection. The input selection of the device is automatically done. By default, the DisplayPort input has priority over the DVI input. This can be changed in the OSD menu.

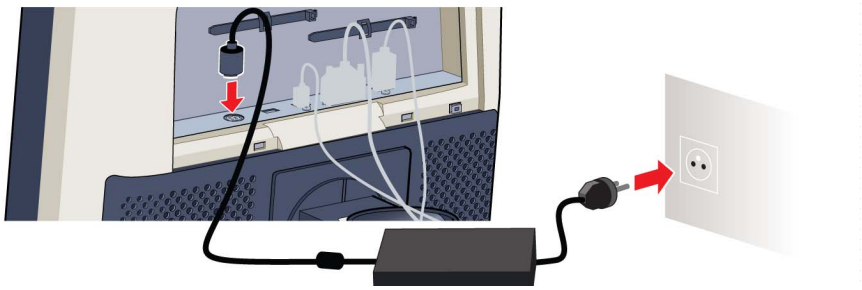
1. Connect the DVI or DP of the display controller to the DVI or DP connector of the display.



2. If you want to make use of the display's USB upstream connector, connect a PC USB downstream connector to the display's USB upstream connector.



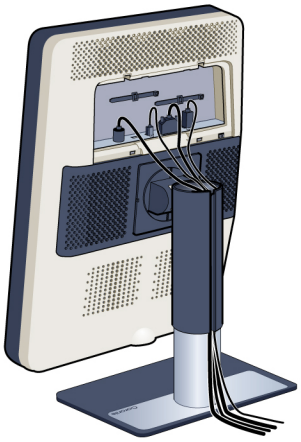
3. If you have chosen to use the display's USB downstream connector, connect a USB device to the downstream connector.
4. Connect the supplied external DC power supply to the +24 Vdc power input of the display.
5. Plug the mains connector of the external DC power supply to a **grounded** power outlet by means of one of the supplied power cables.



3.5 Routing the cables & Reattach the connector compartment cover

To route the cables

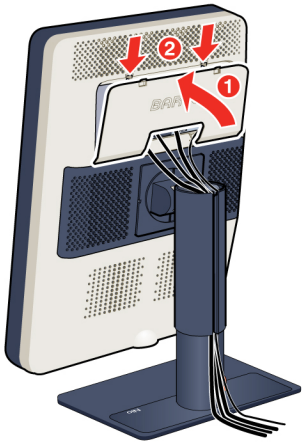
1. Route all connected cables through the cable routing channel in the stand of your display.



Tip: *The cable straps at the inside of the connector compartment allow you to fix the cables for better shielding of the cables.*

To Reattach the connector compartment cover

1. Reattach the connector compartment cover by sliding the cover's bottom in position and then push the cover's top. You'll hear a "click" sound of the cover's clips when the connector compartment cover is in position.



3.6 VESA-mount installation

CAUTION: Use suitable mounting apparatus to avoid risk of injury.

WARNING: Never move a display attached to an arm by pulling or pushing the display itself. Instead, make sure that the arm is equipped with a VESA approved handle and use this to move the display.

Please refer to the instruction manual of the arm for more information and instructions.

WARNING: Use an arm that is approved by VESA (according to the VESA 100 mm standard).

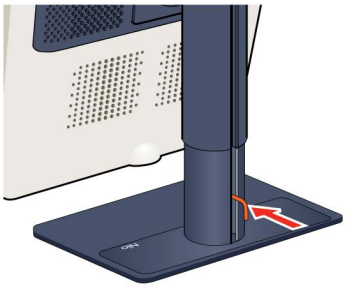
Use an arm that can support the weight of the display. Refer to the technical specifications of this display for the applicable weight.

Overview

The panel, standard attached to the tilt & swivel foot, is compatible with the VESA 100 mm standard. So it can be used with an arm stand according to the VESA 100 mm standard.

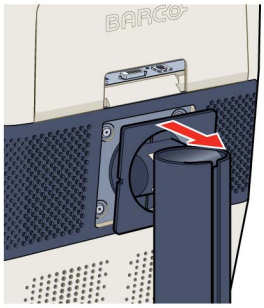
Therefore, the tilt & swivel foot must be removed from the panel.

1. Fasten the height mechanism of the foot by putting the red clip in the hole "Unlocking the height mechanism", page 9 .

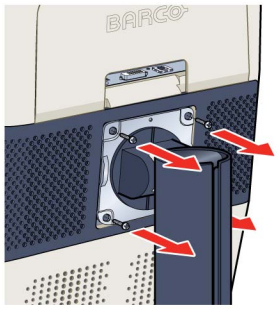


2. Put the display face down on a clean and soft surface. Be careful not to damage the panel screen.
3. Remove the plastic cover with a flathead screw driver.

4. Slide the plastic cover over the neck of the foot.



5. Remove the four screws fixing the foot while supporting the foot.



6. Attach the arm stand **firmly** to the panel using 4 screws M4 x 8 mm.

3.7 First time starting up

Overview

You are now ready to start up your NIO 2MP LED Display for the first time.

1. Switch on your NIO 2MP LED Display as described in "Standby switching", page 16.
2. Turn on the computer connected to your display.

If you have properly installed your display and display controller, the Windows start-up messages will appear once the boot procedure is finished.

Your NIO 2MP LED Display will be running in a basic video mode at a default refresh rate when first time starting up. If you are using a Barco display controller, please consult the user guide delivered with it to install the drivers, software and documentation. When this is done, your display will automatically detect the connected video input signal(s) and apply the correct video mode and refresh rate.

4. DAILY OPERATION

4.1 Recommendations for daily operation

Optimize the lifetime of your display

Enabling the Display Power Management System (DPMS) of your display will optimize its diagnostic lifetime by automatically switching off the backlight when the display is not used for a specified period of time. By default, DPMS is enabled on your display, but it also needs to be activated on your workstation. To do this, go to “Power Options Properties” in the “Control Panel”.

Barco recommends setting DPMS activation after 20 minutes of non-usage.

Use a screen saver to avoid image retention

Prolonged operation of an LCD with the same content on the same screen area may result in a form of image retention.

You can avoid or significantly reduce the occurrence of this phenomenon by using a screen saver. You can activate a screen saver in the “Display properties” window of your workstation.

Barco recommends setting screen saver activation after 5 minutes of non-usage. A good screen saver displays moving content.

In case you are working with the same image or an application with static image elements for several hours continuously (so that the screen saver is not activated), change the image content regularly to avoid image retention of the static elements.

Understand pixel technology

LCD displays use technology based on pixels. As a normal tolerance in the manufacturing of the LCD, a limited number of these pixels may remain either dark or permanently lit, without affecting the diagnostic performance of the product. To ensure optimal product quality, Barco applies strict selection criteria for its LCD panels.

To learn more about LCD technology and missing pixels, consult the dedicated white papers available at www.barco.com/healthcare.

Enhance user comfort

Every Barco multi-head display system is color matched with the highest specifications in the market.

Barco recommends keeping color-matched displays together. Furthermore, it is important to use all displays of a multi-head configuration at the same rate to preserve color matching throughout the economic lifetime of the system.

Maximize quality assurance

The 'MediCal QAWeb' system offers online service for high-grade Quality Assurance, providing maximum diagnostic confidence and uptime.

Barco recommends to install MediCal QAWeb Agent and apply the default QAWeb policy at least. This policy includes calibration on regular intervals. Connecting to MediCal QAWeb Server offers even more possibilities.

Learn more and sign up for the free MediCal QAWeb Essential level at www.barco.com/healthcare/qa.

4.2 Key indicator lights

About the key indicator lights

By default, the indicator lights of the keys will be dimmed which makes the keys unavailable at that moment. To make the keys illuminate and available for further actions touch one of the keys. As a result, all keys will be illuminated and are now available for further actions. However, if no further actions are taken within the following 5 seconds, the keys will dim again.

The key auto-dim function can be disabled in the OSD menus. Please refer to "Key indicator lights", page 20 for detailed instructions on how to do this.

4.3 Standby switching

About standby switching

The connected power supply also provides a switch that can be used to turn the power completely off. To use the display, please make sure to switch on this power supply. This can be done by pushing the on/off switch on the power supply into the "|" position.

Switching on the display while it is in standby mode or vice versa can be done by:

1. Illuminate the keys as previously described.
2. While the keys are illuminated, touch the standby key for approximately 2 seconds.

As a result, the display will switch on or will switch to standby mode. When the display is **switched on**, the power LED is **white**. When the display is in **standby mode**, the power LED is **orange**.

The power LED can be disabled in the OSD menus. Please refer to "Power status indicator light", page 19 for detailed instructions on how to do this.

In case of a power outage recovery, your display will always start-up in the power mode it was in before the power interruption (i.e. standby or on). This protects your display against inadvertent image retention problems.

4.4 Bringing up the OSD menus

How to bring up the OSD menus

The OSD menu allows you to configure different settings to make your NIO 2MP LED Display fit your needs within your working environment. Also, you can retrieve general information about your display and its current configuration settings through the OSD menu.

Bringing up the OSD menus can be done by:

1. If not already done so, switch on the display as previously described.
2. Illuminate the keys as previously described.
3. While the keys are illuminated, touch the menu key.

As a result, the OSD main menu comes up in the bottom right corner of the screen. However, if no further actions are taken within the following 90 seconds, the OSD will disappear again.

The OSD menu auto-exit function can be disabled in the OSD menu. Please refer to "OSD menu automatic close function", page 19 for detailed instructions on how to do this.

4.5 Navigating through the OSD menus

How to navigate through the OSD menus

Navigating through the OSD menus can be done by:

- Use the left/right keys to move through the (sub)menus, change values or make selections.
- To go into a submenu or confirm adjustments and selections, use the menu key.
- Use the standby key to cancel adjustments or exit a (sub)menu.
- Exit all OSD menus at once by touching the standby key for approximately 2 seconds.

The key icons are displayed above the keys, adapted to the function that it is used for (menu dependent).

Overview key icons

Left, Right

Menu

Enter

Cancel

Standby (IEC 60417–5009)

5. ADVANCED OPERATION

5.1 OSD menu language

About the OSD menu language

By default, the OSD menu comes up in English. However, there's a wide range of other languages available for the OSD menu of your NIO 2MP LED Display.

To change the language of the OSD menu:

1. Bring up the OSD main menu.
2. Navigate to the *Configuration* > *User Interface* menu.
3. Enter the *Language* submenu.
4. Select one of the available languages and confirm.

5.2 OSD menu automatic close function

About the OSD menu automatic close function

By default, the OSD menu will disappear automatically after approximately 90 seconds of inactivity. However, this function can be disabled so that the OSD menu remains on the screen until manually closed.

To enable/disable the OSD menu automatic close function:

1. Bring up the OSD main menu.
2. Navigate to the *Configuration* > *User Interface* > *Menu* menu.
3. Enter the *Automatic Close* submenu.
4. Select *Enabled/Disabled* as desired and confirm.

5.3 Power status indicator light

About the power status indicator light

By default, when the display is switched on, the power status indicator light is dimmed. This behavior can be changed so that the power status indicator light will be **green** when the display is switched on.

When the display is in stand-by mode, the power status indicator light will always turn orange, even when the power status indicator light is disabled.

To enable/disable the power status indicator light:

1. Bring up the OSD main menu.
2. Navigate to the *Configuration* > *User Interface* > *Indicator Lights* menu.
3. Enter the *Power Status* submenu.
4. Select *Enabled/Disabled* as desired and confirm.

5.4 Key indicator lights

About the key indicator lights

By default, after lighting up, the key indicator lights will dim again if no further actions are taken within the following 5 seconds. However, this behavior can be changed so that the key indicator lights are always on or always off.

To configure the key indicator lights

1. Bring up the OSD main menu.
2. Navigate to the *Configuration* > *User Interface* > *Indicator Lights* menu.
3. Enter the *Keys* submenu.
4. Select *Automatic/Always On/Always Off* as desired and confirm.

5.5 Power lock function

About the power lock function

By enabling the power lock function, the NIO 2MP LED Display is forced to remain switched on. This means that it can't be switched to stand-by mode until the power lock function is disabled again.

To enable/disable the power lock function:

1. Bring up the OSD main menu.
2. Navigate to the *Configuration* > *User Interface* > *Controls* menu.
3. Enter the *Power Lock* submenu.
4. Select *Enabled/Disabled* as desired and confirm.

5.6 DPMS mode

About DPMS mode

Enabling the Display Power Management System (DPMS) mode on your display will optimize its diagnostic lifetime by automatically switching off the backlight when the display is not used for a specified period of time. By default, DPMS mode is enabled on your display, but it also needs to be activated on your workstation. To do this, go to the "Power options properties" window of your workstation.

Barco recommends setting DPMS activation after 20 minutes of non-usage.

When DPMS mode is enabled on your display, an additional OSD power saving function becomes available: hibernate. Please refer to "Hibernate", page 21 for more information on hibernation and how to enable this function.

To enable/disable DPMS mode on your display:

1. Bring up the OSD main menu.
2. Navigate to the *Configuration* > *Power Management* menu.
3. Enter the *DPMS Mode* submenu.

4. Select *Enabled/Disabled* as desired and confirm.

5.7 Hibernate

About hibernate

Enabling hibernation will not only switch off the backlight but will also force the display to disable other functionalities so that power consumption is further reduced to a minimum. This happens after a specific period of time which can be manually adjusted.

Hibernate can only be enabled on your display when the DPMS mode is enabled first. Therefore, please refer to "DPMS mode", page 20 to do this.

To enable/disable hibernation on your display:

1. Bring up the OSD main menu.
2. Navigate to the *Configuration* > *Power Management* menu.
3. Enter the *Hibernate* submenu.
4. Select *Enabled/Disabled* as desired and confirm.

To specify the hibernate timeout:

1. Bring up the OSD main menu.
2. Navigate to the *Configuration* > *Power Management* menu.
3. Enter the *Hibernate Timeout* submenu.
4. Set the timeout value as desired and confirm.

5.8 Luminance target

About the luminance target

The luminance target of your NIO 2MP LED Display is adjustable over a predefined range. When you change the luminance target, the display will adjust its backlight to reach the target.

To set the luminance target:

1. Bring up the OSD main menu.
2. Navigate to the *Configuration* > *Calibration* menu.
3. Enter the *Luminance Target* submenu.
4. Set a luminance target value as desired and confirm.

The default DICOM calibrated luminance value is available in the technical specifications table. The five year warranty is valid for this setting.

5.9 Viewing modes

About viewing modes

The NIO 2MP LED Display can be used in two viewing modes:

Diagnostic	This mode provides the full calibrated luminance and is intended for using the display for diagnostic purposes.
Text	In this mode, the luminance is reduced to approximately half of the luminance. This is intended for using the display with office applications such as word processing. Please note that text mode is not persistent, once powered off, the unit will restart in diagnostic mode.

As the NIO 2MP LED Display is intended to be used in a diagnostic environment, the diagnostic mode should always be selected.

To select a viewing mode:

1. Bring up the OSD main menu.
2. Navigate to the *Configuration* > *Calibration* menu.
3. Enter the *Viewing Mode* submenu.
4. Select *Diagnostic/Text* as desired and confirm.

5.10 Display functions

About display functions

Native, uncorrected panels will display all grayscale/color levels with luminance increments that are not optimal for crucial diagnostic information. Studies have shown however, that in medical images certain grayscale/color parts contain more diagnostic information then others. To respond to these conclusions, display functions have been defined. These functions emphasize on these parts containing crucial diagnostic information by correcting the native panel behavior.

Native	If you select Native, the native panel behavior will not be corrected.
Dynamic Gamma 1.8 Dynamic Gamma 2.2	These are gamma functions that are shifted to take into account the non-zero luminance of an LCD panel when driven with a “black” signal. They are especially useful in CT applications to improve the perception of low Hounsfield values.
DICOM	DICOM (Digital Imaging and Communications in Medicine) is an international standard that was developed to improve the quality and communication of digital images in radiology. In short, the DICOM display function results in more visible grayscales in the images. Barco recommends selecting the DICOM display function for most medical viewing applications.

User	This display function will be automatically selected when display functions are defined by MediCal QAWeb.
Gamma 1.8 Gamma 2.2	Select one of these display functions in case the display is to replace a CRT display with a gamma of 1.8 or 2.2 respectively.

To select a display function:

1. Bring up the OSD main menu.
2. Navigate to the *Configuration* > *Calibration* menu.
3. Enter the *Display Function* submenu.
4. Select one of the available display functions and confirm.

5.11 Reading rooms

About reading rooms

Reading rooms can only be selected when the DICOM display function is selected. Therefore, please refer to "Display functions", page 22 to correctly set the display function.

The American Association of Physicists in Medicine (AAPM) composed a list of pre-defined reading rooms. Each of these reading rooms are defined by following parameters:

- the maximum light allowed in this type of room

The available reading rooms for your NIO 2MP LED Display are:

Dark Room	Corresponds to light conditions of ideal dark room. This setting disables the ambient light compensation.
CR/DR/ MAMMO	Corresponds to light conditions in diagnostic reading rooms for computed radiology, digital radiology or mammography. This setting has the lowest maximum ambient light.
CT/MR/NM	Corresponds to light conditions in diagnostic reading rooms for computed tomography, magnetic resonance or nuclear medicine scans.
Staff Office	Corresponds to light conditions in office rooms.
Clinical Viewing Room	Corresponds to light conditions in diagnostic reading rooms for clinical viewing.
Emergency Room	Corresponds to light conditions in emergency rooms.
Operating Room	Corresponds to light conditions in operating rooms. This setting has the highest maximum ambient light.

To select a reading room:

1. Bring up the OSD main menu.
2. Navigate to the *Configuration* > *Calibration* > *Reading Room* menu.
3. Enter the *Reading Room* submenu.
4. Select one of the available reading rooms and confirm.

5.12 Display orientation

About Display orientation

Your display automatically detects its physical orientation (portrait or landscape) and, by default, automatically adjusts the image orientation to this. This means that when your display is physically rotated, the image will rotate along.

The OSD menu however, allows to overrule this behavior and force the image orientation to portrait or landscape regardless of the physical orientation of the display. This may be especially useful when operating your display with the screen facing upwards.

To set the Display orientation

1. Bring up the OSD main menu.
2. Navigate to the *Configuration* > *Image Sources* menu.
3. Enter the *Display Orientation* submenu.
4. Select *Landscape/Portrait/Automatic* as desired and confirm.

5.13 Video input signals

About input signals

The available input signals for your display are:

DisplayPort 1	The input corresponding to the DisplayPort connector.
DVI 1	The input corresponding to the DVI connector.
Automatic Selection	The input is automatically selected.

To manually select a video input signal:

1. Bring up the OSD main menu.
2. Navigate to the *Configuration* > *Image Source* menu.
3. Enter the *Input Signal* submenu.
4. Select one of the available input signals and confirm.

5.14 EDID timings

About EDID timings

Following EDID timings are available for your NIO 2MP LED Display:

Refresh Rate	Allows to manually select the refresh rate of the image source video input signal depending on the maximum refresh rate of the display controller connected to your display.
Preferred Orientation	Allows to change the orientation of the image source video input signal to landscape, portrait or to let the display automatically assign the correct orientation.
Color Depth	Allows to change the color depth to 8 or to 10 bit.

To manually set EDID timings:

1. Bring up the OSD main menu.
2. Navigate to the *Configuration* > *Image Source* menu.
3. Enter the *Timings* submenu.
4. Select *Refresh Rate, Preferred Orientation* or *Color Depth*.
5. Select one of the available settings and confirm.

5.15 Display info

About display info

Your display serial number, color type, native resolution, firmware versions, etc. are available in a dedicated submenu of the OSD menu.

To retrieve info about your display:

1. Bring up the OSD main menu.
2. Navigate to the *About this Display* menu to make the information visible on the screen.

5.16 Display status

About display status

The Status submenu of the OSD menu provides info on the current status of your display (runtimes, temperatures, etc.), the status of the connected image sources (video encoding mode, timings, etc.), the current calibration status of your display (display function, luminance, ALC, etc.) and the status about activated connections.

To retrieve the status of your display:

1. Bring up the OSD main menu.
2. Navigate to the *Status* menu.
3. Enter the *Display, Image Sources, Calibration* or *Connectivity* submenu as desired.

6. MAINTENANCE

General maintenance information

The NIO 2MP LED Display does not require any scheduled maintenance or calibration activities. We recommend to use QAWeb with the Barco default tests and frequencies to calibrate and maintain the display or return the display to a Barco approved maintenance organization. In any case of doubts, contact the Barco Healthcare Division

6.1 Cleaning instructions

To clean the display

Clean the display using a sponge, cleaning cloth or soft tissue, lightly moistened with plain water.

Do not use following products:

- Alcohol/solvents at higher concentration > 5%
- Strong alkalis lye, strong solvents
- Acid
- Detergents with fluoride
- Detergents with ammonia
- Detergents with abrasives
- Steel wool
- Sponge with abrasives
- Steel blades
- Cloth with steel thread

CAUTION: Take care not to damage or scratch the front glass or LCD. Be careful with rings or other jewelry and do not apply excessive pressure on the front glass or LCD.

CAUTION: Do not apply or spray liquid directly to the display as excess liquid may cause damage to internal electronics. Instead, apply the liquid to a cleaning cloth.

7. IMPORTANT INFORMATION

7.1 Safety information

General recommendations

Read the safety and operating instructions before operating the device.

Retain safety and operating instructions for future reference.

Adhere to all warnings on the device and in the operating instructions manual.

Follow all instructions for operation and use.

Electrical Shock or Fire Hazard

To prevent electric shock or fire hazard, do not remove cover.

No serviceable parts inside. Refer servicing to qualified personnel.

Do not expose this apparatus to rain or moisture.

Type of protection (electrical):

Display with external power supply: Class I equipment.

Degree of safety (flammable anesthetic mixture):

Equipment not suitable for use in the presence of a flammable anesthetic mixture with air or with oxygen or nitrous oxide.

Non-patient care equipment

- Equipment primarily for use in a health care facility that is intended for use where contact with a patient is unlikely (no applied part).
- The equipment may not be used with life support equipment.
- The user should not touch the equipment, nor its signal input ports (SIP)/signal output ports (SOP) and the patient at the same time.

Power connection – Equipment with external 24 VDC power supply

- Power requirements: The equipment must be powered using the delivered medical approved 24 VDC (⎓) SELV power supply.
- The medical approved DC (⎓) power supply must be powered by the AC mains voltage.
- The power supply is specified as a part of the ME equipment or combination is specified as a ME system.
- To avoid the risk of electric shock, this equipment must only be connected to a supply mains with protective earth.
- The equipment should be installed near an easily accessible outlet.
- The equipment is intended for continuous operation.

Transient over-voltage

If the device is not used for a long time, disconnect it from the AC inlet to avoid damage by transient over-voltage.

To fully disengage the power to the device, please disconnect the power cord from the AC inlet.

Power cords:

- Use a power cord that matches the voltage of the power outlet, which has been approved and complies with the safety standard of your particular country.
- Do not overload wall outlets and extension cords as this may result in fire or electric shock.
- Mains lead protection (U.S.: Power cord): Power cords should be routed so that they are not likely to be walked upon or pinched by items placed upon or against them, paying particular attention to cords at plugs and receptacles.
- The power supply cord should be replaced by the designated operator only at all time.

Grounding reliability

Grounding reliability can only be achieved when the equipment is connected to an equivalent receptacle marked “Hospital Only” or “Hospital Grade”

Accessory equipment

Accessory equipment connected to the analog and digital interfaces must be in compliance with the respective nationally harmonized IEC standards (i.e. IEC 60950 for data processing equipment, IEC 60065 for video equipment, IEC 61010-1 for laboratory equipment, and IEC 60601-1 for medical equipment.) Furthermore all configurations shall comply with the system standard IEC 60601-1-1. Anyone who connects additional equipment to the signal input part or signal output part is configuring a medical system, and is therefore, responsible that the system complies with the requirements of the system standard IEC 60601-1-1. The unit is for exclusive interconnection with IEC 60601-1 certified equipment in the patient environment and IEC 60XXX certified equipment outside of the patient environment. If in doubt, consult the technical services department or your local representative.

Water and moisture

Never expose the display to rain or moisture.

Never use the display near water - e.g. near a bathtub, washbasin, swimming pool, kitchen sink, laundry tub or in a wet basement.

Ventilation

Do not cover or block any ventilation openings in the cover of the set. When installing the device in a cupboard or another closed location, heed the necessary space between the set and the sides of the cupboard.

Installation

Place the device on a flat, solid and stable surface that can support the weight of at least 3 devices. If you use an unstable cart or stand, the device may fall, causing serious injury to a child or adult, and serious damage to the device.

This apparatus conforms to:

CE0120 (MDD 93/42/EEC; A1:2007/47/EC class IIb product), CE - 2004/108/EC, CE - 93/42/EEC; A1:2007/47/EC class II b, IEC 60601-1(ed.3), ANSI/AAMI ES 60601-1:2005 + C1:2009, CAN/CSAC22.2 No. 60601-1-08:2008, DEMKO - EN 60601-1:2006, EN 60601-1-2:2007, CCC - GB9254-2008 + GB4943.1-2011 + GB17625.1-2012, KC, VCCI, FCC class B, ICES-001 Level B, FDA 510(k), RoHS

National Scandinavian Deviations for CL. 1.7.2:

Finland: "Laite on liitettävä suojamaadoituskoskettimilla varustettuun pistorasiaan"

Norway: "Apparatet må tilkoples jordet stikkontakt"

Sweden: "Apparaten skall anslutas till jordat uttag"

7.2 Environmental information

Disposal Information

Waste Electrical and Electronic Equipment

This symbol on the product indicates that, under the European Directive 2012/19/EU governing waste from electrical and electronic equipment, this product must not be disposed of with other municipal waste. Please dispose of your waste equipment by handing it over to a designated collection point for the recycling of waste electrical and electronic equipment. To prevent possible harm to the environment or human health from uncontrolled waste disposal, please separate these items from other types of waste and recycle them responsibly to promote the sustainable reuse of material resources.

For more information about recycling of this product, please contact your local city office or your municipal waste disposal service.

For details, please visit the Barco website at: http://www.barco.com/en/AboutBarco/weee

Turkey RoHS compliance

Türkiye Cumhuriyeti: AEEE Yönetmeliğine Uygundur.

[Republic of Turkey: In conformity with the WEEE Regulation]

中国大陆 RoHS

Chinese Mainland RoHS

根据中国大陆《电子信息产品污染控制管理办法》(也称为中国大陆RoHS)，以下部分列出了Barco产品中可能包含的有毒和/或有害物质的名称和含量。中国大陆RoHS指令包含在中国信息产业部MCV标准：“电子信息产品中有毒物质的限量要求”中。

According to the “China Administration on Control of Pollution Caused by Electronic Information Products” (Also called RoHS of Chinese Mainland), the table below lists the names and contents of toxic and/or hazardous substances that Barco’s product may contain. The RoHS of Chinese Mainland is included in the MCV standard of the Ministry of Information Industry of China, in the section “Limit Requirements of toxic substances in Electronic Information Products”.

零件项目(名称) **Component name**	**有毒有害物质或元素** **Hazardous substances and elements**					
	铅 **Pb**	**汞** **Hg**	**镉** **Cd**	**六价铬** **Cr6+**	**多溴联苯** **PBB**	**多溴二苯醚** **PBDE**
印制电路配件 Printed Circuit Assemblies	x	o	o	o	o	o
液晶面板 LCD panel	x	o	o	o	o	o
外接电(线)缆 External Cables	x	o	o	o	o	o
内部线路 Internal wiring	o	o	o	o	o	o
金属外壳 Metal enclosure	o	o	o	o	o	o

零件项目(名称) Component name	有毒有害物质或元素 Hazardous substances and elements					
	铅 Pb	汞 Hg	镉 Cd	六价铬 Cr6+	多溴联苯 PBB	多溴二苯醚 PBDE
塑胶外壳 Plastic enclosure	o	o	o	o	o	o
散热片(器) Heatsinks	o	o	o	o	o	o
电源供应器 Power Supply Unit	x	o	o	o	o	o
风扇 Fan	o	o	o	o	o	o
文件说明书 Paper Manuals	o	o	o	o	o	o
光盘说明书 CD manual	o	o	o	o	o	o
O: 表示该有毒有害物质在该部件所有均质材料中的含量均在 SJ/T 11363-2006 标准规定的限量要求以下. O: Indicates that this toxic or hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement in SJ/T11363-2006.						
X: 表示该有毒有害物质至少在该部件的某一均质材料中的含量超出 SJ/T 11363-2006 标准规定的限量要求. X: Indicates that this toxic or hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement in SJ/T11363-2006						

在中国大陆销售的相应电子信息产品(EIP)都必须遵照中国大陆《电子信息产品污染控制标识要求》标准贴上环保使用期限(EFUP)标签。Barco产品所采用的EFUP标签(请参阅实例，徽标内部的编号使用于制定产品)基于中国大陆的《电子信息产品环保使用期限通则》标准。

All Electronic Information Products (EIP) that are sold within Chinese Mainland must comply with the “Electronic Information Products Pollution Control Labeling Standard” of Chinese Mainland, marked with the Environmental Friendly Use Period (EFUP) logo. The number inside the EFUP logo that Barco uses (please refer to the photo) is based on the “Standard of Electronic Information Products Environmental Friendly Use Period” of Chinese Mainland.

7.3 Regulatory compliance information

Indications for use

The NIO 2MP LED Display (MDNC-2221) is intended to be used in displaying and viewing digital images for review by trained medical practitioners. These devices must not be used in primary image diagnosis in mammography. Caution (USA): Federal law restricts this device to sale by or on the order of a physician. (Details & exemptions are in the Code of Federal Regulations Title 21, 801 Part D).

FCC class B

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This device has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This device generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this device does cause harmful interference to radio or television reception, which can be determined by turning the device off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the device and receiver.
- Connect the device into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Canadian notice

This ISM device complies with Canadian ICES-001.

Cet appareil ISM est conforme à la norme NMB-001 du Canada.

7.4 EMC notice

General information

No specific requirement on the use of external cables or other accessories except power supply.

With the installation of the device, use only the delivered power supply or a spare part provided by the legal manufacturer. Using another can result in a decrease of the immunity level of the device.

Electromagnetic emissions

The NIO 2MP LED Display is intended for use in the electromagnetic environment specified below. The customer or the user of the NIO 2MP LED Display should assure that it is used in such an environment.

Emissions test	Compliance	Electromagnetic environment – Guidance
RF emissions CISPR 11	Group 1	The NIO 2MP LED Display uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.

Emissions test	Compliance	Electromagnetic environment – Guidance
RF emissions CISPR 11	Class B	The NIO 2MP LED Display is suitable for use in all establishments, including domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic emissions IEC 61000-3-2	Class D	
Voltage fluctuations/ flicker emissions IEC 61000-3-3	Complies	

This NIO 2MP LED Display complies with appropriate medical EMC standards on emissions to, and interference from surrounding equipment. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Interference can be determined by turning the equipment off and on.

If this equipment does cause harmful interference to, or suffer from harmful interference of, surrounding equipment, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna or equipment.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced technician for help.

Electromagnetic immunity

The NIO 2MP LED Display is intended for use in the electromagnetic environment specified below. The customer or the user of the NIO 2MP LED Display should assure that it is used in such an environment.

Immunity test	IEC 60601 Test levels	Compliance level	Electromagnetic environment – guidance
Electrostatic discharge (ESD) IEC 61000-4-2	± 6kV contact ± 8kV air	± 6kV contact ± 8kV air	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%
Electrical fast transient/burst IEC 61000-4-4	± 2kV for power supply lines ± 1kV for input/ output lines	± 2kV for power supply lines ± 1kV for input/ output lines	Mains power quality should be that of a typical commercial or hospital environment
Surge IEC61000-4-5	± 1 kV line(s) to line(s) ± 2 kV line(s) to earth	± 1 kV line(s) to line(s) ± 2 kV line(s) to earth	Mains power quality should be that of a typical commercial or hospital environment

Immunity test	**IEC 60601** **Test levels**	**Compliance level**	**Electromagnetic environment – guidance**
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	< 5% U_T [1](> 95% dip in U_T) for 0.5 cycle 40% U_T (60% dip in U_T) for 5 cycles 70% U_T (30% dip in U_T) for 25 cycles < 5% U_T (>95% dip in U_T) for 5s	< 5% U_T (> 95% dip in U_T) for 0.5 cycle 40% U_T (60% dip in U_T) for 5 cycles 70% U_T (30% dip in U_T) for 25 cycles < 5% U_T (>95% dip in U_T) for 5s	Mains power quality should by that of a typical commercial or hospital environment. If the user of the NIO 2MP LED Display requires continued operation during power mains interruptions, it is recommended that the NIO 2MP LED Display be powered from an uninterruptible power supply or a battery.
Power frequency (50/60 Hz) magnetic field IEC 61000-4-8	3 A/m	Not applicable [2]	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.
Conducted RF IEC 61000-4-6 Radiated RF IEC 61000-4-3	3 Vrms 150 kHz to 80 MHz 3 V/m 80 MHz to 2.5 GHz	3 V 3 V/m	Portable and mobile RF communications equipment should be used no closer to any part of the NIO 2MP LED Display, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. Recommended separation distance **d = 1.2√P** **d = 1.2√P** 80 MHz to 800 MHz **d = 2.3√P** 800 MHz to 2.5 Ghz Where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in meters (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site

1. is the a.c. mains voltage prior to application of the test level.
2. NIO 2MP LED Display doesn't contain susceptible components to magnetic fields

Immunity test	IEC 60601 Test levels	Compliance level	Electromagnetic environment – guidance
			survey,[3] should be less than the compliance level in each frequency range.[4] Interference may occur in the vicinity of equipment marked with symbol:

At 80 MHz and 800 MHz, the higher frequency range applies.

These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

Recommended separation distance

The NIO 2MP LED Display is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer of the user of the NIO 2MP LED Display can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the NIO 2MP LED Display as recommended below, according to the maximum output power of the communications equipment.

Rated maximum output power of transmitter [5] W	Separation distance according to frequency of transmitter		
	150kHz to 80MHz $d=1.2\sqrt{P}$	80MHz to 800MHz $d=1.2\sqrt{P}$	800MHz to 2.5GHz $d=2.3\sqrt{P}$
0.01	0.12	0.12	0.23
0.1	0.38	0.38	0.73
1	1.2	1.2	2.3
10	3.8	3.8	7.3
100	12	12	23

At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.

3. Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the NIO 2MP LED Display is used exceeds the applicable RF compliance level above, the NIO 2MP LED Display should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orienting or relocating the NIO 2MP LED Display.
4. Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m.
5. For transmitters rated at a maximum output power not listed above, the recommended separation distance d in meters (m) can be estimated using the equation applicable to the frequency of the transmitter. Where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

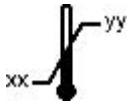
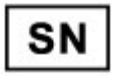
These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection form structures, object and people.

7.5 Explanation of symbols

Symbols on the device

On the device or power supply, you may find the following symbols (nonrestrictive list):

CE	Indicates compliance with the Directive 93/42/EEC as Class I device
CE 0120	Indicates compliance with the Directive 93/42/EEC as Class II device
FC	Indicates compliance with Part 15 of the FCC rules (Class A or Class B)
CLASSIFIED UL	Indicates the device is approved according to the UL regulations
CLASSIFIED C UL US	Indicates the device is approved according to the UL regulations for Canada and US
D	Indicates the device is approved according to the UL Demko regulations
CCC	Indicates the device is approved according to the CCC regulations
VCCI	Indicates the device is approved according to the VCCI regulations
KC	Indicates the device is approved according to the KC regulations
	Indicates the device is approved according to the BSMI regulations
	Indicates the USB connectors on the device
	Indicates the DisplayPort connectors on the device

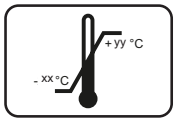
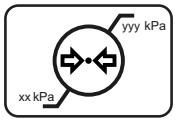
	Indicates the manufacturing date
	Indicates the temperature limitations[6] for the device to safely operate within specs
	Indicates the device serial no.
	Warning: dangerous voltage
	Caution
	Consult the operating instructions
	Indicates this device must not be thrown in the trash but must be recycled, according to the European WEEE (Waste Electrical and Electronic Equipment) directive
	Indicates Direct Current (DC)
	Indicates Alternating Current (AC)
	Stand-by
	Equipotentiality

Symbols on the box

On the box of the device, you may find the following symbols (nonrestrictive list):

	Indicates a medical device that can be broken or damaged if not handled carefully when being stored.
	Indicates a medical device that needs to be protected from moisture when being stored.
	Indicates the storage direction of the box. The box must be transported, handled and stored in such a way that the arrows always point upwards.
	Indicates the maximum number of boxes to be stacked on each other.

6. Values for xx and yy can be found in the technical specifications paragraph.

	Indicates that the box should be carried with two persons.
	Indicates that the box should not be cut with a knife, a cutter or any other sharp object.
	Indicates the temperature limits to which the medical device can be safely exposed when being stored.
	Indicates the range of humidity to which the medical device can be safely exposed when being stored.
	Indicates the range of atmospheric pressure to which the medical device can be safely exposed when being stored.

7.6 Legal disclaimer

Disclaimer notice

Although every attempt has been made to achieve technical accuracy in this document, we assume no responsibility for errors that may be found. Our goal is to provide you with the most accurate and usable documentation possible; if you discover errors, please let us know.

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Patent information

This product is covered under the following intellectual property rights:

US Patent RE43,707

7.7 Technical specifications

Overview

Product acronym	MDNC-2221
Screen technology	IPS-Pro
Active screen size (diagonal)	540 mm (21.3”)
Active screen size (H x V)	324,9 mm x 433,2 mm (12.79” x 17.1”)
Aspect ratio (H:V)	4:3
Resolution	2MP (1600 x 1200)
Pixel pitch	0.27
Color imaging	Yes
Gray imaging	No
Number of grayscales (LUT in/LUT out)	1024 gray levels (10/10)
Viewing angle (H, V)	88°
Uniform Luminance Technology (ULT)	Yes
Per Pixel Uniformity (PPU)	No
Ambient Light Compensation (ALC)	No
Backlight Output Stabilization (BLOS)	Yes
Front Sensor	Yes
Maximum luminance	800 cd/m² typical
DICOM calibrated luminance (ULT off)	400 cd/m²
Contrast ratio (ULT off)	1400 typical
Response time (Tr + Tf)	20 ms
Scanning frequency (H; V)	15-128 kHz; 25-98 Hz
Housing color	Black / White
Video input signals	DVI-D Single Link / DisplayPort
Video inout terminals	NA
USB ports	1 upstream, 2 downstream
USB standard	2.0
Power requirements (nominal)	100-240V
Power consumption (nominal)	50W
Power save mode	Yes
Power management	DVI-DMPM
Dot clock	162 MHz
OSD languages	English, German, French, Dutch, Spanish, Italian, Portugese, Polish, Russian, Swedish, Chinese (simplified), Japanese, Korean, Arabic
Dimensions with stand (W x H x D)	Portrait: (w x hmax x d) 378 x 625 x 235 mm (w x hmin x d) 378 x 525 x 235 mm Landscape: (w x hmax x d) 491 x 565.5 x 235 mm (w x hmin x d) 491 x 465.5 x 235 mm
Dimensions w/o stand (W x H x D)	378 x 491 x 83.2 mm
Dimensions packaged (W x H x D)	655 x 388 x 495 mm
Net weight with stand	12.6 kg (with glass) – 11.32 kg (without glass)

Net weight w/o stand	7.6 kg (with glass) – 6.32 kg (without glass)
Net weight packaged with stand	16.8 kg (with glass) – 15.52 kg (without glass)
Net weight packaged w/o stand	N/A
Height adjustment range	100 mm
Tilt	-5° / +25°
Swivel	-30° / +30°
Pivot	N/A
Mounting standard	VESA (100 mm)
Screen protection	Protective, non-reflective glass cover (option)
Recommended modalities	CT, MR, US, DR, CR, NM, Film
Certifications	CE0120 (MDD 93/42/EEC; A1:2007/47/EC class IIb product), CE - 2004/108/EC, CE - 93/42/EEC; A1:2007/47/EC class II b, IEC 60601-1(ed.3), ANSI/AAMI ES 60601-1:2005 + C1:2009, CAN/CSAC22.2 No. 60601-1-08:2008, DEMKO - EN 60601-1:2006, EN 60601-1-2:2007, CCC - GB9254-2008 + GB4943.1-2011 + GB17625.1-2012, KC, VCCI, FCC class B, ICES-001 Level B, FDA 510(k), RoHS
Supplied accessories	User Guide
	Quick Installation Sheet
	Video cables (1 x DVI Single Link + 1 x DisplayPort)
	Main cables (UK, European (CEBEC/KEMA), USA (UL/ CSA; adaptor plug NEMA 5-15P), Chinese (CCC))
	USB 2.0 cable
	Adapter BRIDGEPOWER JMW190KB2400F11 (I/P: 100-240V, 50-60Hz, 2A, O/P: 24V, 3.75A):as forming part of the medical device
Optional accessories	None
QA software	MediCal QAWeb
Units per pallet	NA
Pallet dimensions (W x H)	NA
Warranty	5 years
Operating temperature	0°C to 35°C (15°C to 30°C within specs)
Storage & transport temperature	-20°C to 60°C
Operating humidity	8% - 80% (non-condensing)
Storage & transport humidity	5% - 85% (non-condensing)
Operation altitude	2000 m
Storage & transport altitude	7500 m

7.8 Compatible display controllers

Overview

Barco strongly recommends to use a Barco display controller with your display. All Barco display controllers compatible with your display can be found in the options-tab on the product-page of your display on www.barco.com.

A user guide of the display controllers is available on the cd-rom delivered with the unit.

7.9 Open source license information

Open source license information

Open source license usage

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